

ABSTRACT OF THE DISCLOSURE

A diffusion media and a scheme for spatially varying the parameters of the diffusion media to address issues related to water management in electrochemical cells and other devices employing the diffusion media are provided. A device is configured to convert a hydrogenous fuel source to electrical energy and comprises an electrochemical conversion assembly, first and second reactant inputs, first and second product outputs, and first and second diffusion media. The device is configured such that a mesoporous layer is carried along at least a portion of a major face of one of the first and second diffusion media substrates. The mesoporous layer comprises a hydrophilic carbonaceous component and a hydrophobic component. The mesoporous layer occupies a substantially greater portion of one of the high or low H<sub>2</sub>O regions of the device, relative to the other of the high or low H<sub>2</sub>O region of the device.